

Serial No. 10/090,826

Docket No.: 1450.1017

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~striketrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please CANCEL claim 16 and AMEND claims 17, 19, 21 and 23 in accordance with the following:

1. (CANCELED)
2. (PREVIOUSLY PRESENTED) A control device for a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:
 - a request receiving circuit receiving a request access to the semiconductor memory device;
 - a determining circuit determining whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device based on the access request received by the request receiving circuit;
 - an instruction outputting circuit supplying the access instruction for enabling the auto precharge function or the access instruction for disabling the auto precharge function to the semiconductor memory device in accordance with a result of the determination by the determining circuit; and
 - an area setting circuit in which address information showing an area in the semiconductor memory is set, wherein:
 - the access request includes access address information on an address in the semiconductor memory device to be accessed, and
 - the determining circuit determines whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device by comparing the address information set in the area setting circuit and the access address information of the access request received by the request receiving circuit.
3. (PREVIOUSLY PRESENTED) The control device for the semiconductor memory device according to claim 2, wherein:
 - in the area setting circuit, address information, showing an area in the semiconductor memory device to be accessed by the access instruction for enabling the auto precharge

Serial No. 10/090,826

Docket No.: 1450.1017

function, is set; and

the determining circuit determines that the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device when the access address information of the access request received by the request receiving circuit is included in the address information set in the area setting circuit.

4. (PREVIOUSLY PRESENTED) The control device for the semiconductor memory device according to claim 2, wherein:

In the area setting circuit, address information, showing an area in the semiconductor memory device to be accessed by the access instruction for disabling the auto precharge function, is set; and

the determining circuit determines that the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device when the access address information of the access request received by the request receiving circuit and the address information set in the area setting circuit are different.

5. (PREVIOUSLY PRESENTED) The control device for the semiconductor memory device according to claim 2, wherein:

the area setting circuit is a register in which a setting is changeable from the outside.

6. (PREVIOUSLY PRESENTED) A control device for a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

a request receiving circuit receiving a request access to the semiconductor memory device;

a determining circuit determining whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device based on the access request received by the request receiving circuit; and

an instruction outputting circuit supplying the access instruction for enabling the auto precharge function or the access instruction for disabling the auto precharge function to the semiconductor memory device in accordance with a result of the determination by the determining circuit, wherein:

the request receiving circuit receives a signal indicating an access type with the access request, and

the determining circuit determines whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device

Serial No. 10/090,826

Docket No.: 1450.1017

according to the signal indicating the access type received by the request receiving circuit.

7. (PREVIOUSLY PRESENTED) The control device for the semiconductor memory according to claim 6, wherein:

the signal indicating the access type is a signal indicating sequential access in which sequential areas, in the semiconductor memory device are accessed, or random access, in which random areas in the semiconductor memory device are accessed; and

the determining circuit determines that the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device when random access is indicated by the signal indicating the access type which is received by the request receiving circuit.

8. (PREVIOUSLY PRESENTED) A control device for a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

a request receiving circuit receiving a request access to the semiconductor memory device, the access request including data size information showing a quantity of data to be transferred;

a determining circuit determining whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device based on the access request received by the request receiving circuit;

an instruction outputting circuit supplying the access instruction for enabling the auto precharge function or the access instruction for disabling the auto precharge function to the semiconductor memory device in accordance with a result of the determination by the determining circuit;

a transfer number computing circuit computing a number of times of access to the semiconductor memory device based on the data size information of the access request received by the request receiving circuit; and

the determining circuit determining whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device based on the number of times of access computed by the transfer number computing circuit.

9. (PREVIOUSLY PRESENTED) The control device for the semiconductor memory device according to claim 8, wherein:

the transfer number computing circuit includes a counter circuit counting the number of

Serial No. 10/090,826

Docket No.: 1450.1017

times of access to the semiconductor memory device; and

the determining circuit determines whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device according to a value counted by the counter circuit.

10. (PREVIOUSLY PRESENTED) The control device for the semiconductor memory device according to claim 9, wherein:

each time an access instruction is outputted from the instruction outputting circuit to the semiconductor memory device, the counter circuit decrements a count value by one with the number of times of access to the semiconductor memory device computed based on the data size information of the access request received by the request receiving circuit as an initial value; and

the determining circuit determines that the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device when the value counted by the counter circuit is one.

11. (PREVIOUSLY PRESENTED) A control device for a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

a request receiving circuit receiving a request access to the semiconductor memory device outputted respectively from a plurality of master circuits a determining circuit determining whether or not the access instruction, enabling the auto precharge function is supplied to the semiconductor memory device based on the access request received by the request receiving circuit;

an instruction outputting circuit supplying the access instruction for enabling the auto precharge function or the access instruction for disabling the auto precharge function to the semiconductor memory device in accordance with a result of the determination by the determining circuit; and

the determining circuit determines whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device depending on the master circuits which outputted the access requests received by the request receiving circuit.

12. (PREVIOUSLY PRESENTED) The control device for the semiconductor memory device according to claim 11, further comprising:

a master setting circuit in which a master circuit, supplying the access instruction enabling the auto precharge function in response to the access request received by the request

Serial No. 10/090,826

Docket No.: 1450.1017

receiving circuit, is set.

13. (PREVIOUSLY PRESENTED) The control device for the semiconductor memory device according to claim 12, wherein:

the master setting circuit is a register in which a setting is changeable from the outside.

14. (PREVIOUSLY PRESENTED) The control device for the semiconductor memory device according to claim 12, wherein:

the master setting circuit is allowed to set whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device in response to the respective access requests from the plurality of master circuits received by the request receiving circuit.

15. (PREVIOUSLY PRESENTED) A control device for a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

a request receiving circuit receiving a request access to the semiconductor memory device;

a determining circuit determining whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device based on the access request received by the request receiving circuit;

an instruction outputting circuit supplying the access instruction, enabling the auto precharge function, or the access instruction, disabling the auto precharge function to the semiconductor memory device, in accordance with a result of the determination by the determining circuit;

a prefetch controlling circuit reading data in an area specified by the access request and, in addition, data in sequential areas subsequent to the specified area when the access request received by the request receiving circuit is a read access request; and

the determining circuit determining that the access instruction, disabling the auto precharge function, is supplied to the semiconductor memory circuit when the access request received by the request receiving circuit is the read access request.

16. (CANCELLED)

Serial No. 10/090,826

Docket No.: 1450.1017

17. (CURRENTLY AMENDED) A method of controlling a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

receiving a request for access to the semiconductor memory device;
determining whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device, based on the received access request;
supplying the access instruction enabling the auto precharge function or the access instruction disabling the auto precharge function to the semiconductor memory device, in accordance with a result of the determination. The method of controlling the semiconductor memory device according to claim 16, wherein:

the access request includes access address information on an address in the semiconductor memory device to be accessed; and

the determining, of whether or not the access instruction enabling the auto precharge function is supplied to the semiconductor memory device, is performed by comparing the address information showing an area set in the semiconductor memory device and the received access address information of the access request.

18. (PREVIOUSLY PRESENTED) The method of controlling the semiconductor memory device according to claim 17, wherein:

the address information is address information showing an area in the semiconductor memory device to be accessed by the access instruction enabling the auto precharge function; and

the determining, of whether or not the access instruction, enabling the auto precharge function, determines that the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device when the set address information matches the received access address information of the access request.

19. (CURRENTLY AMENDED) A method of controlling a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

receiving a request for access to the semiconductor memory device;
determining whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device, based on the received access request;
supplying the access instruction enabling the auto precharge function or the access instruction disabling the auto precharge function to the semiconductor memory device, in accordance with a result of the determination; and

Serial No. 10/090,826

Docket No.: 1450.1017

~~The method of controlling the semiconductor memory device according to claim 16, further comprising:~~

receiving a signal indicating an access type with the access request, wherein the determining, of whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory circuit, and of whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device, is determined in accordance with the received signal indicating the access type.

20. (PREVIOUSLY PRESENTED) The method of controlling the semiconductor memory device according to claim 19, wherein:

the signal indicating the access type is a signal indicating sequential access, in which sequential areas in the semiconductor memory device are accessed, or random access, in which random areas in the semiconductor memory device are accessed ; and

the determining, of whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device determines that the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device when random access is indicated by the received signal indicating the access type.

21. (CURRENTLY AMENDED) A method of controlling a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

receiving a request for access to the semiconductor memory device;

determining whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device, based on the received access request;

supplying the access instruction enabling the auto precharge function or the access instruction disabling the auto precharge function to the semiconductor memory device, in accordance with a result of the determination. ~~The method of controlling the semiconductor memory device according to claim 16, wherein:~~

a prefetch function, to read data in an area specified by the access request and, in addition, data in sequential areas subsequent to the specified area, is provided when the received access request is a read access request; and

the determining of whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device, further determines that the access instruction, disabling the auto precharge, is supplied to the semiconductor memory device when the received access request is the read access request.

Serial No. 10/090,826

Docket No.: 1450.1017

22. (PREVIOUSLY PRESENTED) A method of controlling a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

receiving a request for access to the semiconductor memory device having data size information showing a quantity of data to be transferred;

computing a number of times of access to the semiconductor memory device based on the data size information of the received access request;

determining whether or not the access instruction enabling the auto precharge function is supplied to the semiconductor memory device, based on the computed number of times of access; and

supplying the access instruction enabling the auto precharge function or the access instruction disabling the auto precharge function to the semiconductor memory device in accordance with a result of the determination.

23. (CURRENTLY AMENDED) A method of controlling a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

receiving a request for access to the semiconductor memory device outputted from any one of a plurality of master circuits;

determining whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device in accordance with the master circuit which outputs the received access request; and

supplying the access instruction, enabling the auto precharge function, or the access instruction, disabling the auto precharge function, to the semiconductor memory device, in accordance with a result of the determination.